Observing & Forecasting

Sea & Swell Waves

REFERENCES

- USN Manual for Ship's Surface Wx Observations
- 7th Fleet AOR Forecaster's Handbook
- www.mid-c.com/manmar/waves.htm
- AG1 and Chief NAVEDTRA 12853
- www.bro.swt.edu/lavalli/oceans/studentpages

TERMS

Sea- Wind waves observed during their generating area (fetch), with the wave direction being that of the local wind direction.

- Wind waves have sharper peaks and irregular appearances.

TERMS

Swell- Ocean waves which have traveled out of their generation area.

- They are no longer under the influence of the wind that generated them.

- Characteristics exhibit a more regular & longer period & a flatter crest.

Terms Cont.

Period- Time (seconds) between the passage of tw
consecutive wave crests (troughs) past a fixed poi

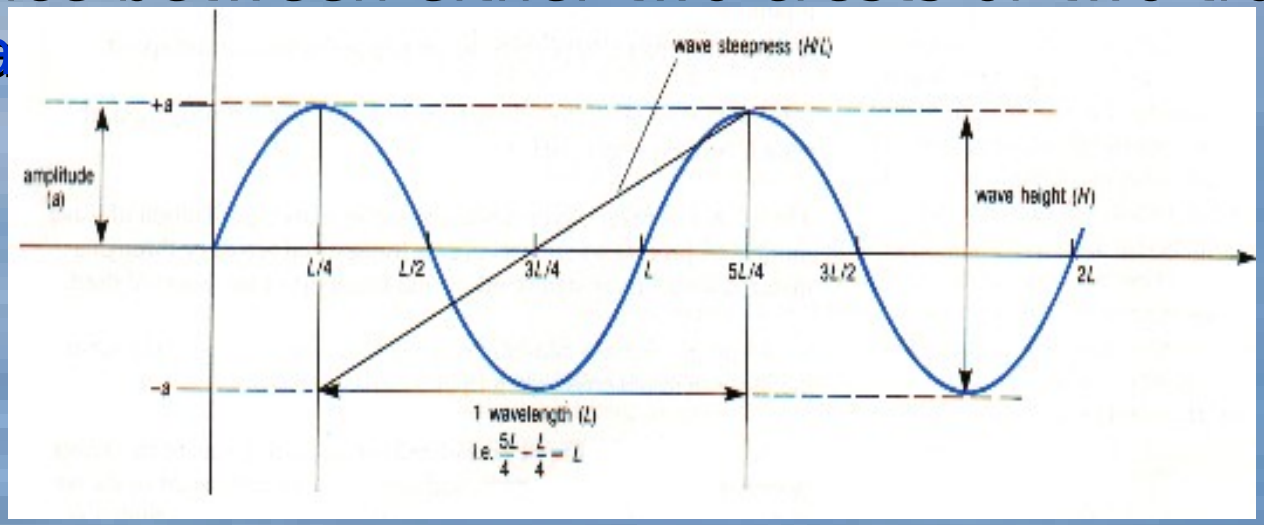
Height- Vertical difference between the wave tro
crest.

Direction- Direction **from** which the waves are c

Length- Horizontal distance from one wave crest
crest, or the distance from one wave trough to the

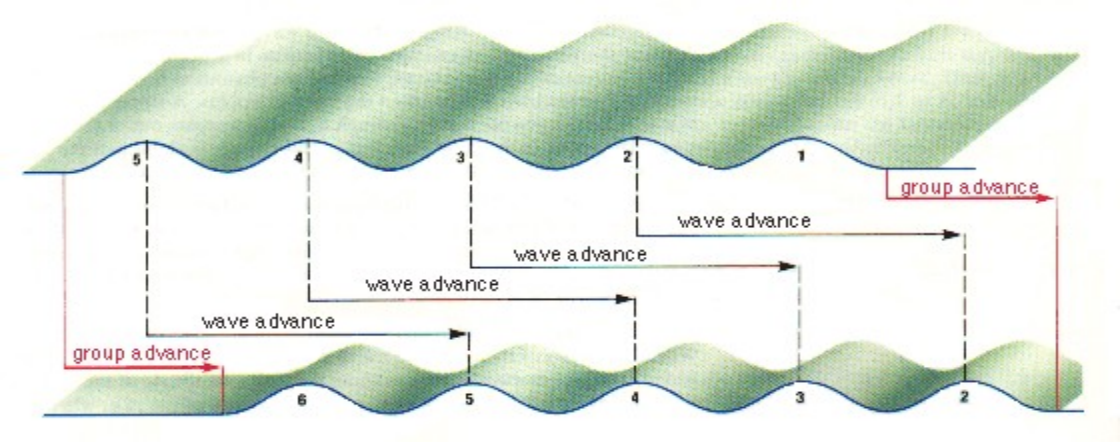
ANATOMY OF A WAVE

- To understand the how and why of waves, one must first be acquainted with the basic anatomy of a wave.
- The crest of a wave is the highest point of the wave above the normal still water level.
- This is offset by the trough which is the lowest point of a wave between two crests.
- The distance between either two crests or two troughs is defined a



PROPAGATION

- Waves are not solitary entities. Waves travel in groups as they move across a body of water.
- These groups of moving waves are called **wave trains** and have some interesting properties.
- Waves, contrary to what one might expect, do not transport water with them. Waves simply set individual water particles into an orbital motion and transfer the energy of the wave forward to produce the new leading wave.



Observing Wave Heig

- **Try not to underestimate low waves and overestima**

•The best way to obtain a wave height estimation is obser
ship in company.

•The height from trough to crest of a wave against the
ship's side can be estimated using some known vertical di

- Example, a wave might be 1/4 of the bridge height of 28

•When no other ships are present, the best way to determ
must be determined by the wave action on the side of the
ship.

Cont.,

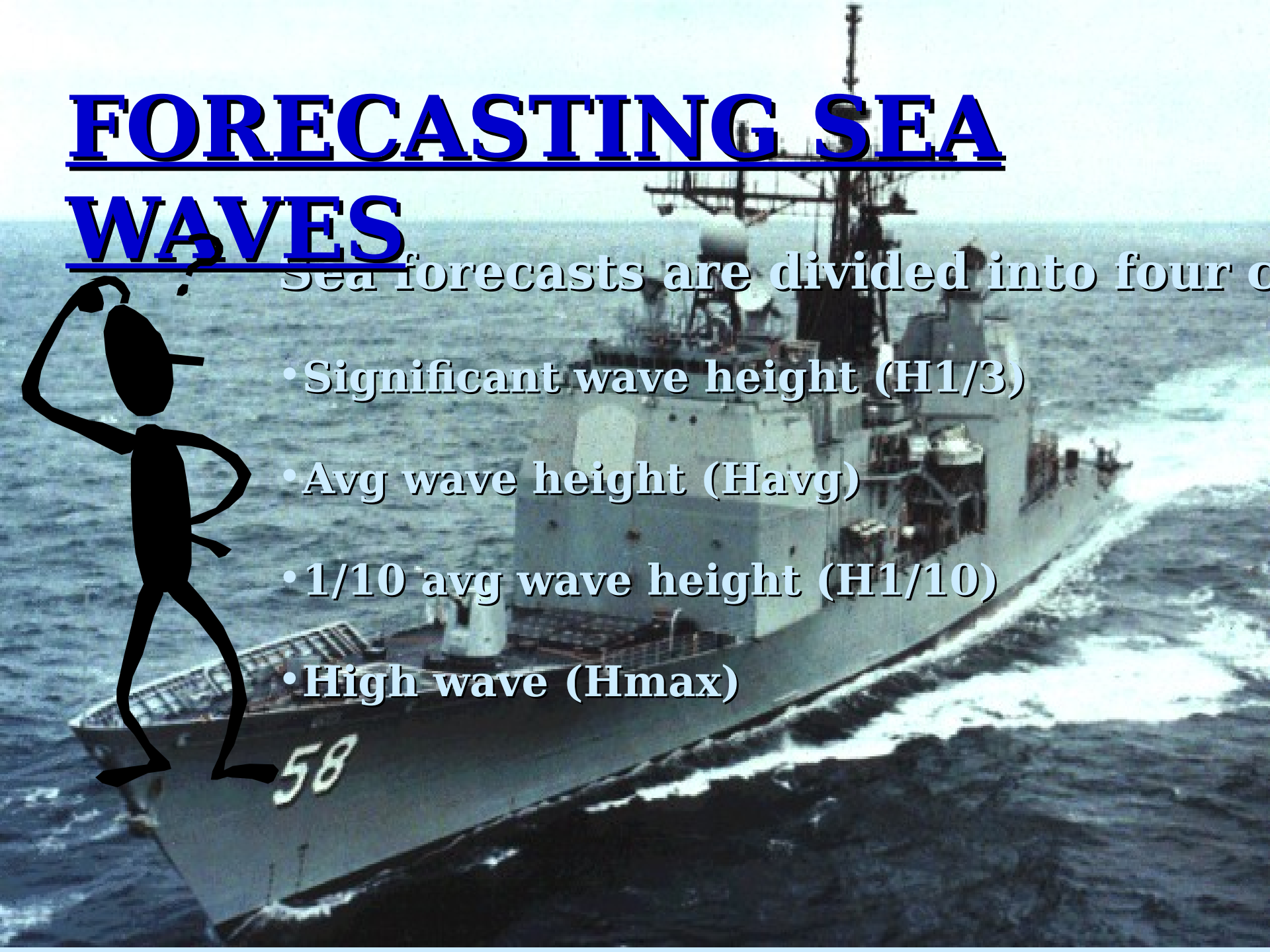
• When no other ships are present, observe the wave actio
the ship or near the ship for height(s).

• Observe wind waves on the windward side of the ship as
water line as possible.

• Observe a swell along side the ship from which the swel
(Windward when ship is running into the swell).

• When the ship is rolling & pitching, or in a turn or runni
high swell, the side of the ship **should not** be used to det
height.

FORECASTING SEA WAVES



Sea forecasts are divided into four c

- Significant wave height (H1/3)
- Avg wave height (Havg)
- 1/10 avg wave height (H1/10)
- High wave (Hmax)

Observing at Night/ Low

- On very dark nights or in the dense fog, th observer can hope for is an estimate of the the sea waves.

- Swell waves are difficult to observe at any at night it becomes almost impossible.

SEA- STATE FORECAST

- The first step in a sea-state forecast consist of three pa

- Determine avg wind speed over the fetch.

- Determine length of fetch.

- Determine how long the wind speed has remained the s
fetch. (t_d)

These three parts can be obtained by using **surface wea**

SEA- STATE FORECAS

- The second step is the determination of t_{min} (minimum ti
for a give wind to produce a fully developed sea in a given

- The third step is comparing t_d and t_{min} and selecting the
two as the effective duration (t_d').

- The fourth step is to determine the fetch wave height (H
period (Tf).

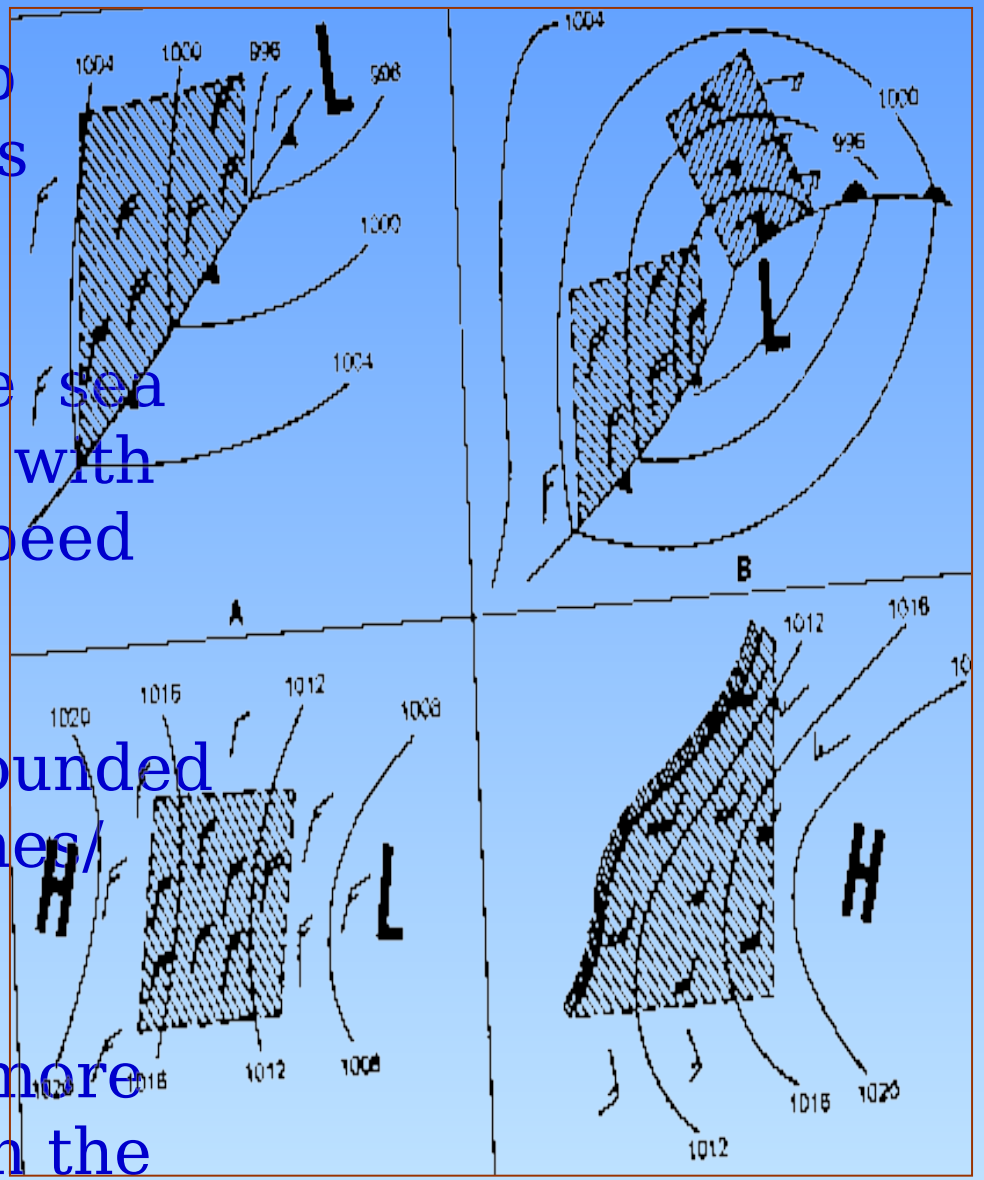
- The fifth step is to determine the (Havg), ($H_{1/10}$), and (H

In all cases, the first step toward a wave forecast is locating the fetch.

- A fetch is an area of the sea surface over which wind with a constant direction & speed is blowing.

- Most fetch areas are bounded by coastlines, frontal zones/ change in isobars.

- It’s a good idea to use more than one fetch area when the curvature of the isobars are large.



REPORTING SWELL WAV

- The swell direction differs from the wind direction by 30
- The swell period differs from the wind wave period by 4s
- Any additional swell systems must differ in direction fro wind direction & each evaluated swell direction by 30deg
- When determining swell waves, use the avg wave height direction from which the swell is coming.

SEA- SWELL FORECAS

- The first step in forecasting swell is the height and peri
significant waves departing the fetch.

- The second step is the computation of Ho (swell height)

- The third step is determination of the estimated time of
of the first swell waves at the forecast point.
(Add travel time to the DTG of the surface chart from whi
chart was made).

SHIP OBSERVATION

BBXX 28064 99375 11275 43497 62115
10089 20052 40175 54000 70211 866//
22232 00167 20302 30502 40404 50605

2PwPwHwHw

When decoding, convert wave height to feet.

3dw1dw1dw2dwd2
4Pw1Pw1Hw1Hw1
5PPw2Pw2Hw2Hw2
(2 DIFFERENT SWELL WAVES MAY BE REPORTED)